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AUTHOR Hays, Ron; And Others
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ABSTRACT

Research has revealed relationships among a wide range of substance use behaviors, including smoking, alcohol use, and drug use. To investigate whether a substance use factor emerges when different indicators of substance use, different samples, and three health related issues, (i.e., meal regularity, exercise and hours of sleep) are examined, the patterns of substance use in 226 New England high school students (93 males, 127 females, and 6 unidentified), with a mean age of 16, and in 199 Southern California college students (123 females, 76 males), with a mean age of 21, were studied using an extensive survey questionnaire. The questionnaire assessed meal regularity, drug use, alcohol use, smoking, exercise, and sleep. An analysis of the results showed that drug use, alcohol use, and smoking were significantly related in all four subsamples: high school males and females; and college males and females. Factor analysis indicated that drug use, alcohol use, and smoking formed a cohesive substance use factor, suggesting that different forms of substance use may be attributable to similar motives and that these behaviors may serve related functions for those who engage in them. Although meal regularity, exercise, and hours of sleep failed to show a consistent pattern of relationship, meal regularity did correlate with less drug use and more hours of sleep in all groups except college males. (BL)

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The Covariation and Factor Structure of Substance Use
and Other Health-Related Behaviors in Two Samples

Ron Hays, Alan Stacy, and M. Robin DiMatteo

University of California, Riverside

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The Covariation and Factor Structure of Substance Use
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Abstract

The co-variation of substance use (alcohol use, drug use, smoking) is investigated in a cross-sectional study of 226 New England high school students and 199 college students at a Southern California university. Drug use, alcohol use and smoking are significantly related in each of four subsamples (high school males, high school females, college males, college females). Factor analysis indicates that drug use, alcohol use and smoking form a cohesive substance use factor. Measures of meal regularity, exercise and hours of sleep, also included in the study, do not exhibit stable loadings on the substance use factor or form another factor among themselves.

The Covariation and Factor Structure of Substance Use
and Other Health-Related Behaviors in Two Samples

The degree to which substance use constitutes a syndrom rather than separate or idiosyncratic activities is an important research issue [1]. Significant bivariate relationships have been reported between smoking and alcohol use [1,2,2,4,5], smoking and drug use [1,2,3,6], and alcohol and drug use [1,2,3,6,7,8,9,10].

While previous research has revealed relationships among a wide range of substance use behaviors, analyses of these data have been less than optimal. Information on the associations among various substance use activities has been primarily limited to results from bivariate frequency distributions [10] and bivariate correlations [9]. However, a few studies have also conducted multivariate analyses on their data in order to examine the dimensionality of substance use behavior. In a study of 12 drug use variables (including one bogus drug), McKillip, Johnson, and Petzel [11] reported a varimax rotated factor solution containing three factors: hard drugs, social drugs, and the bogus drug. These authors failed to indicate the estimates of commonalities they employed for this analysis. Blum and Associates [2] found four principle components in their analysis of nine substance use measures. However, they used an inefficient estimation (principle components analysis) method for the factors underlying the data. When a common factor model was adequately tested [12], frequency of use of alcohol, marijuana and

"hard drugs" in a sample of seventh, eighth and ninth graders was found to fit both a common factor and simplex model of drug involvement.

Establishing the extent to which various substance use behaviors are interrelated and determining the dimensions underlying them is critically important for two major reasons. First, treatment (e.g., for addictive behavior) may be better implemented if groups of related behaviors are similarly addressed. For instance, "it has been argued that the need for treatment could be more efficiently and effectively met by programs combining individuals who have more than one drug of abuse, focusing on psychological problems underlying their dependencies rather than on the treatment for a specific drug" [13, pp. 112-113]. Secondly, the understanding of substance use behavior is more likely to be achieved if its dimensionality is discovered.

Studying patterns of substance use in high school and college individuals is important because "what transpires in this period has inescapable implications and continuing consequences for later life" [8, p. 5]. It is frequently during these years that drug use [14], alcohol use [15], and cigarette smoking [16] are initiated and lifelong behavioral patterns are begun. The present study extends previous research by investigating whether a substance use factor emerges when (1) different indicators of substance use, (2) different samples, and (3) three additional health-related behaviors are included. The interrelationships among drug use, alcohol use, smoking, meal regularity, exercise, and hours of sleep are examined in a questionnaire study of high school and college students.

Method

Subjects

High School Sample. A total of 226 students (93 males, 127 females, 6 unstated) were surveyed. (Five of these respondents did not complete the entire questionnaire, and the following percentages do not sum to 100% because not all subjects responded to each item.) The mean age of the sample was 16.7 (sd= 0.8), with a range from 15 to 18 years old. The majority of the sample was White (92.9%), while 3.5% specified a different ethnic status. Twenty-four (10.6%) individuals were in the tenth grade, 99 (43.8%) were in the eleventh grade, and 98 (43.4%) were twelfth graders. The following religious affiliations were reported: Catholic (73.9%), Baptist (3.5%), unspecified Protestant (3.5%), Presbyterian (2.2%), United Church of Christ (1.3%), Episcopalian (0.9%), Methodist (0.4%), other affiliations (3.5%), and agnostic or atheist (6.6%). Most of the respondents had never been married (96.5%), though two were married (0.9%) and one was divorced (0.4%). The modal combined annual parental income category chosen by respondents was \$30,000--39,999 (26.5%). Combined parental income reported ranged from \$110,000 or over (1.3%) to less than \$3,000 (0.9%). Sixty-four percent of the sample perceived themselves to be "middle class." Perceived social class status ranged from "upper class" (1.3%) to "lower class" (0.4%).

College Sample. In the college sample, 199 students (123 females, 76 males) participated. The mean age was 21.0 (sd=4.5), ranging from 17 to 48 years old. Most of the participants were White (54.3%), followed by

Black (15.6%), Chicano(a) (14.6%), Chinese (3.5%), Japanese (3.0%), other Asian (3.5%), and other ethnic statuses (5.0%). Fifty-eight (29.1%) respondents were college freshmen, 30 (15.1%) were sophomores, 37 (18.6%) were juniors, 54 (27.1%) were seniors, and 14 (7.0%) were students who had previously received a Bachelor's degree. The following religious affiliations were reported: Catholic (31.2%), agnostic or atheist (22.6%), Baptist (9.5%), Methodist (6.0%), Nondenominational Christian (4.5%), Jewish (4.0%), Presbyterian (4.0%), Lutheran (2.5%), Seventh Day Adventist (2.0%), Mormon (2.0%), United Church of Christ (1.5%), Pentecostal (1.0%), Episcopalian (1.0%), and other affiliations (6.0%). Most of the respondents had never been married (88.9%), 11 were married (5.5%), 10 were divorced (5.0%), and one was separated (0.5%). The modal combined annual parental income category chosen by respondents was \$20,000--29,999 (17.1%). Combined parental income reported ranged from \$110,000 or over (1.5%) to less than \$3000 (2.0%). Forty-two percent of the sample perceived themselves to be "middle class." Perceived social class status ranged from "upper class" (2.0%) to "lower class" (3.5%).

Procedure

Pilot Study. A pilot study was conducted to develop a valid and reliable questionnaire assessing social learning and health-related behavior. The pretest was conducted on 46 college students at a Southern California university in the winter of 1981. Based on responses to this

preliminary survey, an improved questionnaire was constructed.

High School Sample. A 16-page questionnaire assessing social learning and health-related behavior was administered to students by a teacher at a New England high school during the spring of 1981. Students in English classes were asked to volunteer for the survey. Less than 5% of those asked to participate refused to do so. Respondents filled out the questionnaire during a 45-minute class period, with most of them finishing in about 30 minutes.

College Sample. College students at a Southern California university voluntarily completed a 19-page questionnaire (expanded version of the high school questionnaire) for course credit or \$2 payment during the spring and summer terms of 1981. Respondents were recruited from psychology classes, filled out the survey at their leisure, and returned the completed forms to the authors. Less than 10% of those asked to participate refused to do so. Both the high school and college respondents were informed of the anonymity of the data, and unit identification numbers were used to protect them in this regard.

Measures of Behavior

Meal regularity. Two questions about the regularity of meals comprise this scale. Respondents were asked to indicate how often they eat breakfast (every day or nearly every day, several times a week, a few times a week, rarely, or never) and how often they skip meals (very often, often,

occasionally, very rarely, or never).

Drug use. Ten items constitute the drug use scale. The extent (never, once, occasionally, frequently) to which respondents have used tranquilizers, psychedelics, stimulants, cocaine, barbiturates, marijuana or hashish, other opiates, PCP, diet pills, and sleeping pills was assessed. Nonmedical inhalants and heroin were included in the survey, but they were dropped from this scale because they had zero variance in one of the samples.

Alcohol use. A quantity-frequency index [17] was computed by dividing the number of days respondents drank beer, wine, and liquor in the last month by 30 and multiplying these three values by the corresponding amount of beer, wine or liquor they usually drank at one sitting. The resulting products were multiplied by a constant representing the number of ounces of absolute alcohol per drink for each of the three types of alcohol and summed to form an index of absolute ounces of alcohol consumed per day on the average.² This index is a composite designed to summarize information on frequency and quantity of alcohol intake.

Smoking. Two items assessing the quantity (about one and one-half packs a day, about one pack a day, about one-half pack a day, less than one-half pack a day, non-smoker) and frequency (open-ended responses) of cigarette smoking in the last six months were combined to form the smoking index.

Exercise. Six items form the exercise scale. Respondents were asked how often (almost daily, several times a week, sometimes, never)

they engage in swimming, jogging, strenuous physical work, and other active sports, how often they generally exercise (daily or almost daily, several times a week, about once a week, less than once a week, almost never or never), and how much exercise they get relative to other people (a great deal less, somewhat less, about as much as most other people, somewhat more, a great deal more).

Sleep. One open-ended question assessed the hours of sleep respondents obtained on the average.

Results

Item frequencies were computed to provide information about the nature of the high school and college sample.

High School Sample. For the high school sample, 43.8% of the respondents reported eating breakfast "nearly every day," 6.6% "several times a week," 16.8% "a few times a week," 29.2% "rarely," and 3.5% "never." In addition, 7.1% reported they "never" skip meals, 27.4% "very rarely," 40.3% "occasionally," 18.1% "often," and 7.1% "very often." Most respondents (58.2%) reported having used marijuana one or more times in their lives. Somewhat less reported using stimulants (20.0%), diet pills (19.7%), and psychedelics (16.7%). Fewer respondents reported use of opiates other than heroin (7.5%), tranquilizers (7.1%), sleeping pills (6.4%), cocaine (5.2%), barbiturates (4.8%), PCP (2.4%),

and heroin (0.5%). No respondents reported ever using nonmedical inhalants. Most respondents reported that they had had a drink of alcohol at least once (94.6%) in their lives. Respondents who drank reported drinking beer, wine, and liquor an average of 4.9, 2.7, and 3.4 days, respectively, during the month prior to completing the questionnaire. They drank an average of 4.7 beers, 3.2 glasses of wine, and 3.8 drinks of hard liquor during a typical sitting in the past month. About one-fourth (24.1%) of the sample reported ever smoking cigarettes on a fairly regular basis. Current smokers reported smoking an average of 20.4 days during the previous month, while "less than one half pack per day" was the modal quantity of smoking per day in the last six months. With regard to exercise, 42.7% of the sample reported "daily or almost daily" exercise, 32.4% reported exercising "several times a week," 14.7% "about once a week," 5.8% "less than once a week," and 4.4% "never or almost never." Hours of sleep ranged from 5 to 11 with a mean of 7.5 hours per night.

College Sample. For the college sample, 47.0% of the respondents reported eating breakfast "nearly every day," 14.6% "several times a week," 14.6% "a few times a week," 20.7% "rarely," and 3.0% "never." Furthermore, 5.6% reported they "never" skip meals, 19.2% "very rarely," 44.9% "occasionally," 22.2% "often," and 8.1% "very often." Many respondents (44.3%) reported having used marijuana one or more times in their lives. A considerable number of respondents reported use of tranquilizers (17.1%), stimulants (16.3%), diet pills (15.9%),

cocaine (15.5%), and opiates other than heroin (13.4%). Use of sleeping pills (10.9%), barbiturates (9.5%), psychedelics (8.2%), nonmedical inhalants (4.2%), and PCP (3.6%) were reported by somewhat less of the sample. No use of heroin was reported. Most respondents reported that they had had a drink of alcohol at least once (92.9%) in their lives. Respondents who drank reported drinking beer, wine, and liquor an average of 6.7, 3.4, and 3.6 days, respectively, during the month prior to completing the questionnaire. They drank an average of 2.5 beers, 2.6 glasses of wine, and 2.8 drinks of hard liquor during a typical sitting in the past month. Less than one-fifth (17.3%) of the sample reported ever smoking cigarettes on a fairly regular basis. Current smokers reported smoking an average of 23.0 days during the previous month. The quantity of cigarettes smoked per day in the past six months was bimodal: "less than one half pack per day" and "about one pack a day" were reported an equal number of times. With regard to exercise, 28.8% of the sample reported "daily or almost daily" exercise, 33.3% reported exercising "several times a week," 17.7% "about once a week," 11.6% "less than once a week," and 8.6% "never or almost never." Hours of sleep ranged from 5 to 10 with a mean of 7.0 hours per night.

Scale Analyses

In order to weight equally the items constituting the scales, item scores were standardized (i.e., transformed to z-scores). Item analyses resulted

in the following: Cronbach [18] alphas and Scott [19] homogeneity ratios,³ respectively, for the five multiple-item scales: meal regularity (high school: .64, .47, n=226; college: .66, .49, n=197), drug use (high school: .76, .24, n=214; college: .84, .34, n=194), alcohol use (high school: .43, .20, n=222; college: .44, .21, n=195), smoking (high school: .95, .91, n=223; college: .95, .90, n=197), and exercise (high school: .73, .31, n=223; college: .75, .34, n=197). Although these behaviors exhibit adequate internal consistency in both the high school and college samples, the index of alcohol use has low item homogeneity and the smoking scale items are extremely homogeneous. Internal consistency was not expected to be high for the alcohol index, since it serves as an indicator of absolute ounces of alcohol consumed and no assumptions about the magnitude of the correlations among beer, wine, and liquor intake were made. The total amount of absolute alcohol each respondent consumes is of interest--not whether various types of alcohol consumption are highly intercorrelated. Internal consistency could not be computed for hours of sleep because this behavior was measured by a single item.

The associations among sex, age, grade in school and the six behaviors were assessed. In the high school sample, males reported greater meal regularity ($r=.29$, $p<.01$), more exercise ($r=.14$, $p<.05$) and more hours of sleep ($r=.14$, $p<.05$) than females. In the college sample males reported more exercise ($r=.15$, $p<.05$) and more alcohol use ($r=.21$, $p<.01$). Older high school respondents and those in the upper grades in high school reported less meal regularity ($r=-.23$, $p<.01$; $r=-.25$, $p<.01$), more smoking ($r=.13$, $p<.05$; $r=.14$, $p<.05$), less exercise ($r=-.13$, $p<.05$;

$r = -.23$, $p < .01$), and fewer hours of sleep ($r = -.14$, $p < .05$; $r = -.15$, $p < .05$).

College students in the upper grades reported significantly less meal regularity ($r = -.14$, $p < .05$), more drug use ($r = .17$, $p < .05$), more alcohol use ($r = .19$, $p < .01$), more smoking ($r = .15$, $p < .05$), more exercise ($r = .15$, $p < .05$), and more hours of sleep ($r = .20$, $p < .01$).

The intercorrelations of the six behaviors were examined in four subsamples (high school males, high school females, college males, college females). Pearson product-moment correlations are shown for each subsample in Table 1.⁴ The three substance use measures (smoking, drug use,

Table 1 about here

alcohol use) display the most reliable intercorrelations. These correlations range from .27 to .67 (all p 's $< .05$), with $\bar{r} = .34$ for high school males, $\bar{r} = .45$ for high school females, $\bar{r} = .39$ for college males, and $\bar{r} = .52$ for college females. For each of the four subsamples, drug use, alcohol use and smoking are significantly associated in the positive direction. In addition, meal regularity is significantly correlated with less drug use and greater hours of sleep in three of four subsamples (high school males, high school females, and college females). Meal regularity is also significantly related to less alcohol use for females in both the high school and college samples, but this relationship is not significant for males.

In order to better represent the associations among the behaviors in this

study, factor analysis was conducted. Soupac [20] factor analysis computer programs were employed to determine the underlying dimensions associated with the six activities. Listwise deletion of cases was used to obtain correlation matrices for the four subsamples (see Table 1). A decision regarding the appropriate number of factors was approached by using multiple criteria including: Guttman's [21] weakest and strongest lower bounds, Montanelli and Humphreys' [22] parallel analysis, Cattell's [23] scree test, maximum likelihood and generalized least squares statistical tests, and the Tucker-Lewis reliability coefficient [24].

The following number of factors were indicated by the above criteria for the high school males, high school females, college males, and college females, respectively: (1) Guttman's weakest lower bound ($n=3,2,2,2$); (2) Guttman's strongest lower bound ($n=3,2,3,3$); (3) Cattell's scree test ($n=2,2,2,1$); (4) Montanelli and Humphrey's parallel analysis ($n=2,2,2,1$); (5) maximum likelihood statistical test and Tucker's reliability coefficient ($n=2,2,2,1$); and (6) generalized least squares statistical test and Tucker's reliability coefficient ($n=2,2,2,1$). These criteria suggest that two-factor solutions are appropriate for the high school male, high school female, and college male subsamples. A one-factor solution is suggested for the college female sample. For the purpose of factor comparison, a maximum likelihood test for the equality of the number of factors across subsamples [25] was also conducted. This test revealed that a two-factor solution ($\chi^2(16)=11.70$, $p>.05$) adequately reproduces the subsample correlation matrices,

but a one-factor solution ($\chi^2(36)=73.80$, $p<.01$) does not. This difference is statistically significant ($\chi^2(20)=62.10$, $p<.01$). Thus, two factors were retained in each subsample for factor comparison.

Common factor analysis using non-iterated squared multiple correlation coefficients as communality estimates (see Table 1) was employed to derive the unrotated matrix. A Harris-Kaiser, Class II factor rotation for nonindependent cluster solutions was performed using non-iterated squared multiple correlations as communality estimates. The rotated solution produced factor correlations of $r = -.07$ for the high school male, $r = -.29$ for the high school female, $r = .12$ for the college male, and $r = -.27$ for the college female subsamples. Factor loadings for both the unrotated and rotated solutions are given in Table 2. Common factor analysis was used instead of principal components analysis in order to examine the common variance among the behaviors, excluding unique variance. Squared multiple correlations were employed as communality estimates because: (1) they are stable; (2) other estimates of communality tend to converge toward this estimate; and (3) they can be used as a lower bound to determine if common factor analysis is appropriate for one's data [26]. In order to achieve simple structure, factor rotation was conducted. The nonindependent solution was chosen to allow variables to load on more than one factor. Oblique rotation was performed because it results in a more realistic representation of the factors [26].

Table 2 about here

The rotated solutions indicate that drug use, alcohol use and smoking load reliably on the first factor. However, in the college male subsample, alcohol use loads more highly on the second factor. Meal regularity and hours of sleep load on the second factor in the high school sample, but they do not load consistently on either factor in the college sample. The loadings of exercise are unreliable for both factors in the high school and college samples. Coefficients of congruence [27] were computed to assess the degree to which corresponding factors are similar in pattern and magnitude across pairs of subsamples.⁵ A variance-covariance matrix with rescaled variables [25] was used to obtain factor loadings for the tests of congruence. Coefficients of congruence range from .78 to .95 for the first factor ($\bar{c}=.88$). Coefficients for the second factor range from -.47 to .88 ($\bar{c}=.22$), indicating much less congruence. On the whole, these results establish the existence of a substance use factor,⁶ but the instability of the loadings on the second factor restricts any substantive interpretation of this dimension.

Discussion

The findings of this study are based on two independent samples, drawn

from a high school and a college population. The interrelationships among the substance use measures are remarkably consonant across both of these samples and among both males and females within these samples. Nonetheless, two caveats need to be kept in mind concerning the results of this study. First of all, additional samples need to be studied to establish the generalizability of these findings. Second, the failure to find a consistent pattern of relationships for meal regularity, exercise, and sleep may be a function of the indicators used for these behaviors. The most appropriate way to measure these activities is an open question and other indicators might lead to somewhat different findings. On the other hand, the inconsistency in the pattern of correlations among these variables may indicate that they are in fact multidimensional as opposed to the unidimensionality of substance use behaviors.

The covariation among alcohol use, drug use, and smoking found in this study suggests that different forms of substance use may be attributable to similar motives and these behaviors may serve related functions for those who engage in them. Along these lines, Griffins, Bigelow and Henningfield [28] have suggested that "common behavioral-pharmacological processes may underlie the self-administration of various drugs" (p. 74). In addition, it has been estimated that between 60 and 80 percent of alcohol abusers and drug abusers also abuse other substances [29].

Implications for treatment and prevention follow from the findings of this research. Treatment directed at substance use as a class of related behaviors may be more beneficial than programs concentrating only on

specific forms of substance use [13,30]. For example, a substance use behavior (e.g., alcohol use) that has been engaged in concurrently with another behavior (e.g., cigarette use) may acquire cue properties (cognitive and/or physiological) that instigate the performance of the concomitant behavior. A heavy smoker who is able to limit his or her alcohol use may reduce the number of instigating cues for cigarette use. In terms of prevention, McAlister, Perry, Killen, Slinkard and Maccoby [31] focused on the substance use dimension (smoking, alcohol use, and marijuana use) and report promising results. Prevention of substance use as a group of connected behaviors may be particularly important among adolescents, who show evidence of initiating substance use in stages [3,12,32]. The efficacy of treatment and prevention directed at the syndrome-like nature of substance use requires further evaluation.

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Footnotes

1

In principal components analysis, no distinction is made among common, specific, and error variance. Since the total variance is not partitioned in this type of analysis, component loadings contain mixed and non-explicit percentages of these three elements of variance. In common factor analysis, on the other hand, specific and error variance do not contaminate factor loadings. Common factor analysis provides a more appropriate interpretation of factor patterns and a greater understanding of the processes generating the data than principal components analysis.

2

The equation used to compute the quantity-frequency index (QFI) is:

$$QFI = \left(\frac{\text{beer frequency} \times \text{quantity}}{30} \times .480 \right) + \left(\frac{\text{wine frequency} \times \text{quantity}}{30} \times .600 \right) + \left(\frac{\text{liquor frequency} \times \text{quantity}}{30} \times .675 \right).$$

3

The homogeneity ratio (HR) is:
$$HR = \frac{S_y^2 - \sum S_i^2}{(\sum S_i)^2 - \sum S_i^2}$$

S_y^2 is the total scale variance and $\sum S_i^2$ is the sum of the item variances in the scale. Unlike coefficient alpha, the homogeneity ratio is an indicator of internal consistency uninfluenced by the number of items in a scale. A homogeneity ratio of about .32 is considered optimal.

4

Scale items were coded in the direction of greater involvement in the measured activity such that higher scores represent greater meal regularity, more drug use, more alcohol use, more smoking, more exercise, and greater hours of sleep.

5

The coefficient of congruence ranges from -1.0, for perfect negative correspondence, to +1.0, for perfect positive correspondence. A value of zero indicates the complete absence of factorial similarity. For the first factor, the coefficients for the high school male subsample paired with the other subsamples are as follows: with high school females (.86); with college males (.78); with college females (.89). The coefficients for high school females paired with other subsamples are as follows: with college males (.90); with college females (.95). The coefficient for college males paired with college females is .87.

6

The interrelationships of the six behaviors were examined for a number of subsamples: tenth graders, eleventh graders, twelfth graders, white high school students, never married high school students, 17-23 year-old college students, and undergraduates. In each of these subsamples, the correlations among alcohol use, drug use, and smoking were positive and statistically significant.

Table 1

Pearson Correlations Among Six Behaviors by Sex
in the High School and College Samples^aHigh School Sample Correlations

	MEAL REGULARITY	DRUG USE	ALCOHOL USE	SMOKING	EXERCISE	HOURS OF SLEEP
MEAL REGULARITY (.20,.22)		-.31 ^c	-.12	-.10	.06	.34 ^c
DRUG USE	-.33 ^c	(.32,.34)	.48 ^c	.27 ^b	.07	-.09
ALCOHOL USE	-.29 ^c	.44 ^c	(.34,.30)	.27 ^b	.20	.22 ^b
SMOKING	-.22 ^b	.46 ^c	.47 ^c	(.11,.31)	-.06	.03
EXERCISE	-.12	.14	-.01	-.06	(.06,.08)	.10
HOURS OF SLEEP	.37 ^c	-.27 ^c	-.15	-.13	-.21 ^b	(.20,.19)

College Sample Correlations

MEAL REGULARITY (.09,.11)		-.19	.05	-.22	.14	-.11
DRUG USE	-.21 ^b	(.38,.50)	.45 ^c	.48 ^c	.07	.10
ALCOHOL USE	-.28 ^c	.67 ^c	(.34,.49)	.25 ^b	.29 ^b	-.18
SMOKING	-.13	.48 ^c	.40 ^c	(.31,.25)	-.20	.08
EXERCISE	-.11	.03	.11	-.03	(.17,.03)	-.02
HOURS OF SLEEP	.20 ^b	-.17	-.20 ^b	-.20 ^b	.03	(.08,.08)

^a Males (High School n=84, College n=70) are above the diagonals. Females (High School n=113, College n=113) are below the diagonals. Listwise deletion of cases was used. The squared multiple correlation estimates of communality used in the factor analyses are located along the principal diagonals of the correlation matrix (males listed first, females listed second). The substance use correlations are outlined in the table.

^b $p < .05$

^c $p < .01$

Table 2

Primary Factor Pattern Loadings for the Unrotated and Rotated Two-Factor Solutions Using Squared Multiple Correlations as Communality Estimates^a

	UNROTATED				ROTATED			
	I	I	II	II	I	I	II	II
MEAL REGULARITY	HS	CO	HS	CO	HS	CO	HS	CO
males	-.35	-.22	.43	.32	-.21	-.35	.50	.21
females	-.51	-.33	.22	.25	-.25	-.21	.43	.30
DRUG USE								
males	.66	.71	-.08	-.01	.61	.63	-.22	.27
females	.67	.77	.02	.10	.54	.77	-.26	-.01
ALCOHOL USE								
males	.63	.54	.28	.41	.68	.27	.14	.60
females	.60	.76	.21	-.05	.62	.70	-.05	-.16
SMOKING								
males	.38	.59	.02	-.28	.37	.65	-.06	-.02
females	.59	.55	.28	.16	.65	.58	.02	.09
EXERCISE								
males	.12	.05	.22	.48	.18	-.19	.19	.46
females	.13	.07	-.35	-.24	-.13	-.03	-.39	-.26
HOURS OF SLEEP								
males	-.02	.04	.55	-.26	.14	.16	.54	-.23
females	-.40	-.29	.36	.07	-.08	-.24	.51	.11
Eigenvalue								
males	1.11	1.19	0.63	0.64				
females	1.58	1.66	0.42	0.16				
Sum of squares								
males					1.07	1.07	0.65	0.74
females					1.19	1.54	0.66	0.20

^a HS designates the high school sample. CO designates the college sample. The substance use loadings for the first rotated factor are outlined in the table. The number of cases for each of the subsamples is given in Table 1.